

# Atypical swallowing treatment with myofunctional devices

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## Abstract

The study, conducted on 420 patients at the Orthodontics division of the U.O.C. of Odontostomatology at Fatebenefratelli San Pietro Hospital in Rome, analyzes the physiological mechanisms of swallowing and evaluates the clinical effectiveness of Froggy Mouth. Froggy Mouth is a removable device made of thermoplastic elastomer, available in three sizes and used to stimulate neural circuits for 15 minutes a day during playful activities. The results show significant improvements in tongue posture and spontaneous resolution of dental malocclusions. Patients, particularly those in the physiological developmental age, achieved predictable and lasting results with minimal commitment. Supporting this are studies by Eric Kandel (Nobel Prize winner in 2000) on the physiological bases of memory and learning, which suggest that involuntary and consistent learning can lead to permanent structural changes in neural circuits. This approach is also confirmed by Dr. Patrick Fellus, the device's creator, who emphasizes the importance of stimulating the posterior part of the tongue. Therefore, Froggy Mouth has proven to be an effective device for correcting atypical swallowing with significant and lasting improvements. However, further studies are needed to confirm these results and explore the mechanisms of action. Multidisciplinary collaboration remains crucial in addressing this complex problem.

**Keywords:** Atypical swallowing, Lingual posture, Froggy mouth, Myofunctional therapy, Dental malocclusions, Speech therapy, Diction, Dentistry.

## Introduction

Swallowing is a complex process for food passage from the mouth to the stomach. It involves precise coordination of muscles and nerves. In recent years, it has been the focus of increasing interest due to technological advances that have improved the understanding and treatment of related disorders (1). Disciplines such as speech therapy, orthodontics, and post-urology work together to study and address these disorders. In the 1950s, Karel and Bertha Bobath, English physiotherapists, were pioneers in emphasizing the importance of language experts in managing swallowing



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problems. Researchers like Barret Hanson and Moyers, followed by Arosen and Logemann in the 1970s, further delved into this field. In 1967, Garliner laid the foundations of myofunctional therapy, aimed at retraining the tongue and face muscles to improve orofacial muscle balance. Swallowing evolves with age (2), transitioning from aerophagia (fetal swallowing) to pedophagia (neonatal and infantile), and then to adult swallowing and presbyphagia (senile). The stages of swallowing include bolus preparation (preparatory stage), movement of the bolus from the mouth to the pharynx (oral propulsive stage), closure of the pharynx to prevent food from entering the airways (pharyngeal stage), and finally, esophageal peristalsis that pushes food into the stomach (esophageal stage) (3). All these stages are regulated by a complex set of sensory and motor stimuli, with the main nerves involved being the trigeminal, facial, glossopharyngeal, vagus, spinal accessory, and hypoglossal nerves. These nerves work in coordination to control the muscles involved in swallowing (4). Physiologically, swallowing begins as early as the thirteenth week of gestation, with the fetus ingesting amniotic fluid. After birth, during breastfeeding, the newborn uses a complex sucking-swallowing mechanism that involves the coordination of lips, tongue, and jaw for milk intake. As the child grows, anatomical and functional changes occur: the facial skeleton develops, the incisor teeth emerge, and the child transitions to solid foods, gradually modifying their swallowing pattern towards a more mature one. In adults, swallowing is characterized by maximum dental intercuspation (5), supported by the masticatory muscles, and the correct position of the tongue, with its tip resting on the upper incisive papilla. The transition from infantile to adult swallowing is a gradual process extending up to 10 years (6). According to some studies, about 30% of children between 6 and 9 years old have not yet achieved fully mature swallowing, thus considered atypical swallowing (7). Atypical swallowing occurs when the transition from infantile to adult swallowing does not proceed correctly, causing orthodontic problems such as anterior tongue thrust and dental malocclusion (8). Proffit classified atypical swallowing into physiological, habitual, functional, and anatomical, while Moyers distinguished between

simple and complex tongue thrust and retentive infantile swallowing (9). Atypical swallowing is often associated with dental malocclusions and altered conditions such as open bite and incisor proclination (10). According to Proffit, anterior tongue thrust is standard in patients with anterior open bites. However, this may be a consequence of the open bite rather than its cause. Atypical swallowing is a complex problem that requires a multidisciplinary approach for effective management. Involving orthodontists, speech therapists, and other specialists can improve orofacial muscle balance (11) and swallowing function, enhancing facial harmony and patients' quality of life.

### Materials and Methods

The Froggy Mouth device was tested on 420 patients at the Orthodontics division of the U.O.C. of Odontostomatology at Fatebenefratelli San Pietro Hospital in Rome. It is a removable device made of light, noninvasive TPE (thermoplastic elastomer), available in three sizes (S, M, L) and three colors (blue, red, and purple) (Fig.1).



Figure 1.

The device is placed between the lips and teeth. To maintain correct head posture, characterized by a 90° angle between the chin and neck (Fig. 2), **the patient must wear it for 15 minutes daily during playful**



Figure 2

**activities like watching TV or playing video games.**

This activates neural circuits that generate automatic movements under the control of the trigeminal nerve, aiming to stimulate the limbic system to facilitate and accelerate learning. The usage protocol includes completing a detailed clinical record containing anamnesis data supported by intraoral and extraoral photographs, dental impressions, and orthopantomographic and lateral-lateral telerradiographs. Lip measurements are taken with a dedicated caliper to select the correct device size, and patient and parent motivation and instruction are crucial (12, 13, 14). Patients are monitored with follow-up visits every 40-60 days and through progressive questionnaires at 3, 6, and 9 months to evaluate therapy progress, summarizing statistical data in a dedicated format. During therapy, periodic evaluations are conducted to monitor progress and make any necessary adjustments to the treatment. The questionnaires, completed by parents, provide additional information on improvements in swallowing behavior and the patient's quality of life.

## Results

Froggy Mouth has proven effective in correcting atypical swallowing and associated problems such as open and deep bites. Clinical results have shown significant improvements in tongue posture and reduction of dental malocclusions. In 82% of cases, an increase in transverse dimension was observed, attributable to the correct tongue positioning in the posterior part of the palate. Simultaneously significant improvements were noted in lip tonicity, facial muscle tone, and mimicry. Patients, particularly those in physiological developmental age, achieved predictable and lasting results with a minimal commitment of 15 minutes daily. Eric Kandel's studies on the physiological bases of memory and learning support the effectiveness of Froggy Mouth, indicating that involuntary and consistent learning can lead to permanent structural and biochemical changes in neural circuits. This approach has been confirmed by Patrick Fellus, the device's creator, who emphasizes the importance of stimulating the posterior part of the tongue rather than the apical part, as in traditional myofunctional therapy (15).

## Discussion

Froggy Mouth has proven effective in correcting atypical swallowing (16), improving tongue posture, and reducing dental malocclusions such as anterior and lateral open bite and cross-bite. The device requires minimal commitment (15 minutes a day), making it more acceptable to patients than traditional therapies. Eric Kandel's studies on the physiological bases of memory and learning support the effectiveness of Froggy Mouth, which, by stimulating the posterior part of the tongue rather than the apical part, facilitates correct tongue posture and promotes automatic and lasting learning of proper swallowing movements. The advantages of Froggy Mouth are numerous, such as minimal invasiveness, ease of use being easily integrated into patients' daily routines, minimal commitment requiring

only 15 minutes a day of use during playful activities, and rapid and lasting results (17). Nonetheless, further studies are necessary to confirm the preliminary results and assess the stability of results over time. However, Froggy Mouth is a significant aid in managing atypical swallowing, improving patients' quality of life, and reducing the need for more invasive interventions. Combining it with traditional speech therapy can accelerate correction.

## Conclusion

Froggy Mouth is an effective device for correcting atypical swallowing, with significant and lasting improvements in growing patients and adults. However, further studies are necessary to confirm these results and explore the mechanisms of action. Multidisciplinary collaboration remains crucial in addressing this complex problem.

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